A. Project Title:	National Clean Diesel Campaign Demonstration Assistance Agreements: Construction Diesel Retrofit Project
B. Applicant:	City of New Haven 165 Church Street New Haven, CT 06510
Project Contact:	Susan Weisselberg, New Haven Public Schools School Construction Program Tel: (203) 946-6811 Fax: (203) 946-5455 Email: susan.weisselberg@new-haven.k12.ct.us
C. Funding Requested:	$140,000.00
D. Total Project Cost:	$140,000.00
E. Project Period:	October 2005 – October 30, 2007
F. Project Description:	The project will demonstrate the feasibility of retrofitting verified advanced emission control devices (ECDs) in nonroad construction equipment. Between 3-6 nonroad vehicles will be retrofit with ECDs verified to meet particulate matter reductions in the Level 3 (>85%) or Level 2 (>50%) range. Eligible ECDs include diesel particulate filters, crankcase filters, or flow-through filters alone or in combination that have been verified by the U.S. Environmental Protection agency (EPA) or the California Air Resources Board (CARB) for on-road use. Selected ECDs will be put to use in a New Haven construction project and made available for evaluation by the manufacturers, EPA and other interested agencies.

Fleet Description:

The following fleet inventory was provided by Michael Giordono, of Giordono Construction Company, Inc.[1] Giordono, Inc. has been contracted by the City of New Haven to construct a new high school in downtown New Haven. It is anticipated that this will be the target project for the proposed demonstration. If, for unanticipated reasons, it is not possible to work with this fleet, there are several other large projects occurring within New Haven during the proposed project period (including the demolition of the New Haven Coliseum and the former Macy's site on the New Haven Green, and the construction of the new Gateway Community College).

Equipment Type	Excavator CAT 330 CL	Bulldozer John Deere 700 H	Wheel Loader CAT 966 G
Est. number of vehicles	3	1 - 2	1 - 2
Engine Model	CAT C9	JD 6068T	CAT 3306 DITA
Engine Model Year	2005	2004	2002
Engine Manufacturer	Caterpillar	John Deere	Caterpillar
Engine Size	247 HP	130 HP	235 HP
Annual Fuel Consumption	Est. 20,000	Est. 20,000	Est. 20,000
Annual Hours of Operation	Est. 2000	Est. 2000	Est. 2000
Who owns, maintains & operates	Giordono Construction	Giordono Construction	Giordono Construction
Description of work performed	Excavates, drives soil beams for retention	Pushes dirt	Loads and unloads material
Fleet replacement rate	Est. 10 years	Est. 10 years	Est. 10 years

Description of Population Near Project Site:

The site for the proposed project is located two blocks from both the Central Business District of New Haven and the Yale-New Haven hospital complex, and is adjacent to the Route 34 connector, one of the busiest roadways in New Haven. Sensitive populations likely to come in contact with emissions from the construction site include patients and visitors to the hospital complex and nearby doctors offices, Central Business District residents and employees, students traveling to and from Career Magnet High School, an existing complex less than a quarter mile away on Route 34. Because subject vehicles will remain on-site for the duration of the construction project, emission benefits will accrue to this area.

More generally, New Haven is a qualifying urban area with a racially and ethnically diverse population. Approximately 21% of the City's 124,000 residents live below the poverty line, and roughly 64% identify themselves as a racial or ethic minority. In the 2000 census, 25.4% of New Haven's population were children under 19 years of age, and 10.3% were above age 65.

[1] Excavator and bulldozer details were directly provided by Giordono. Wheel loader details were not available. Information in the chart above represents a typical wheel loader. Dump trucks will also be used on the job site nearly full time. New Haven is interested in exploring the eligibility of these dump trucks for this funding program.

Location of Vehicle Operation:

Giordono Construction Company, Inc. is a local contractor. In addition to projects within the City of New Haven, the company works along the Connecticut shoreline in New Haven and Fairfield Counties.

The Connecticut shoreline is the recipient of pollution carried by a confluence of two weather patterns, one flowing eastward from the Midwest and another moving northward, up the East Coast from the population centers that range from Washington, DC to New York City. New Haven is located at the intersection of the highly traveled I-95 and I-91 highway corridors and is additionally impacted by the resulting mobile source emissions.

The entire state of Connecticut has been designated as nonattainment for 8-hour ozone. Recently, Fairfield and New Haven Counties were designated as nonattainment areas for $PM_{2.5}$. As part of Connecticut's $PM_{2.5}$ nonattainment designation, design values were established based on three years of monitoring data. All of the $PM_{2.5}$ monitoring sites in Connecticut measured levels below the 24-hour National Ambient Air Quality Standard except for the Stiles Street monitoring site in New Haven, which was the only location in the state to measure values above the standard. (See figure in Appendix A.) In its nonattainment designation, EPA concurred with Connecticut's analysis that the area in the vicinity of the Stiles Street monitor is a hot spot for $PM_{2.5}$ and achieving localized reduction is critical. Because EPA NATA data indicate that diesel emissions account for approximately 20 percent of $PM_{2.5}$ emissions in New Haven County, (likely higher within the City of New Haven), this project will help advance that goal.

National Air Toxics Assessment (NATA) data identified New Haven County as having the second highest quantity of air toxic emissions of any county in New England. Diesel vehicles are responsible for 324 out of 997 tons (one-third) of air toxic emissions captured by the recently completed Air Toxics Inventory (a community air toxics project funded by EPA Region 1). Because of these emission levels and the toxicity of exhaust components, diesel exhaust was identified as the principal pollutant driving health risk in New Haven. The New Haven Air Toxics Inventory report is available on the web at http://www.cityofnewhaven.com/govt/InventoryReport.pdf.

Although there have been no studies to date conclusively linking these environmental data to particular local health outcomes, there is significant evidence to suggest that New Haven residents may suffer disproportionate health impacts due to the air pollution burden. New Haven has the highest rate of childhood asthma in the state of Connecticut – approximately 18% of school-aged children have been diagnosed with asthma. Modeled air toxic concentrations from NATA data predict an additional cancer risk of 800 in one million for New Haven residents. Health studies suggest that measured concentrations of fine particulate matter are high enough to cause respiratory and coronary effects, particularly in sensitive populations.

The New Haven Air Toxics Inventory reports that emissions from construction equipment amount to approximately 104 tons per year. Construction projects often take place in crowded spaces, either residential neighborhoods or commercial districts. The

fact that the location of construction equipment is not limited by zoning or infrastructure means that human exposure to construction emissions is often quite direct. The location of the proposed project site is no exception.

Retrofit Technology Description:

The City will seek to maximize the reduction of particulate emissions from nonroad construction vehicles with a demonstration of EPA or CARB verified technology achieving Level 2 or Level 3 particulate matter reductions on 3-6 appropriate vehicles. Ceramic diesel particulate filters (CARB Level 3-verified) achieve particulate matter emission reductions (>85%). Several DPF systems that have been verified in the United States for on-road applications have been verified and put into use for construction vehicles in Europe. What would therefore be an innovative use in the United States is becoming a conventional use in Europe. Selection of technologies from this group will improve the chances of success in this demonstration project to increase the number of DPF systems verified for nonroad construction use in the US.

The potential issues associated with DPF technology on construction vehicles include filter regeneration sufficient to prevent backpressure buildup, engine configuration that will allow for the DPF installation and the availability of low-sulfur fuel. Because the City has been using ULSD in school buses and the public works fleet since 2002, it is readily available in the area. Exhaust temperatures must meet the minimum required by the technology (250 deg. for at least 25 minutes) or the DPF will not adequately regenerate. Most DPF systems include on-board electric heating units that burn off the soot that collects on the filter. One verified model includes an off-board, plug in regeneration system and several employ the injection of a fuel or catalyst to facilitate soot combustion at lower temperatures. Fugitive dust at a construction site may also be a factor in efficient operation of a DPF system. The exploration of these issues through a feasibility study is the core of this demonstration project.

Engine and exhaust configurations vary significantly from one type of construction vehicle (crane, dozer, grader) to another, from model to model and from year to year. It is anticipated that the chosen vehicle or vehicles will have to be engineered to accommodate the selected DPF system. Swiss engineers have successfully retrofitted over 6,000 construction vehicles with DPF systems verified by the VERT Project (*Verminderung der Emissionen von Real-Dieselmotoren im Tunnelbau*) under authority of the Swiss Agency for the Environment, Forests and Landscape, BUWAL (*Bundersamt für Umwelt, Wald und Landschaft*). (See article in Appendix A.) Information from these installations could facilitate the engineering/installation process.

Advanced diesel oxidation catalysts (otherwise known as particulate reactors or flow-through filters) do not have the same exhaust temperature or engineering requirements and can be installed through a simple muffler replacement. One such device has been verified by CARB as achieving Level 2 control of particulate matter (>50%), a significant incremental emission reduction over a traditional diesel oxidation catalyst. In addition, while DPF application may only be possible on Tier II engines and newer, advanced DOCs may be applicable in older engines. This project will test at least one such device

in the target fleet. Ease of implementation and widespread compatibility make particulate reactors candidates for extensive application in the short-term

Project Description:

The City of New Haven is requesting funding from EPA to retrofit at least four nonroad construction vehicles under contract to the City with advanced emission control devices (ECDs) ECDs verified to meet particulate matter reductions in the Level 3 (>85%) or Level 2 (>50%) range in onroad vehicles. Eligible ECDs include diesel particulate filters, crankcase filters, or flow-through filters alone or in combination that have been verified by the U.S. Environmental Protection agency (EPA) or the California Air Resources Board (CARB) for on-road use. Selected ECDs will be put to use in a New Haven construction project. The likely target project is a demolition, land-readying and construction of a new high school. The contractor, Giordono Construction, Inc. will work with project partners to select and install a verified emission control system on 3-6 vehicles selected by the project engineer and to put those vehicles into use at the school construction site. As part of the demonstration of the feasibility of retrofit ECD technology in construction vehicles, the contractor will also agree to make that vehicle available for evaluation by EPA, other interested agencies, project partners or their agents until the end of the program in October of 2007.

A successful demonstration of nonroad diesel emissions controls will complement New Haven's community-based toxics reduction program, adding to initiatives that have been funded and are already underway through the City's Diesel Reduction Strategy, including: requiring the use of ULSD in municipal fleets since 2002; encouraging the early adoption of ULSD by Yale University and nearby municipalities; retrofitting the entire 182-bus school bus fleet with emissions control equipment; and supporting an initiative to retrofit construction equipment used in the I-95 construction project through New Haven with emission control technology. The City is also seeking funding to retrofit refuse and recycle vehicles with emission control devices, to promote the use of clean fuels and emissions control retrofits for marine and locomotive engines, to retrofit transit buses with DPFs and to assess the feasibility, costs and benefits of requiring emissions control for equipment used for state or municipally funded construction projects in the City through contract specifications.

As an integral piece of the City's comprehensive Diesel Reduction Strategy, the proposed project will further leverage the cooperative efforts of state and community stakeholders and enhance the City's credibility as an advocate for emissions control in non-municipal fleets. This initiative will deliver significant benefits to City residents, particularly sensitive populations. Furthermore, applying this technology on nonroad equipment in the city of New Haven will create a transferable model for construction projects around the state of Connecticut by providing information about the resources, engineering analysis, contractual agreements, etc., necessary to implement such a project at the municipal level. Through this demonstration, New Haven will explore the feasibility and options for encouraging broader application of advanced ECD technology in nonroad

equipment either through a municipal Environmental Management Strategy or other initiative.

Vehicle Selection Process:

Vehicle selection will be based on the following factors:

1. Frequency of use: a vehicle used frequently on a construction site would optimize the emissions reductions, maximize the opportunities to evaluate the technology and increase the potential for widespread adoption of the technology.
2. Specialized use: a construction vehicle that is a big emitter but used for a very specialized function may provide a more innovative, or even unique, use of the DPF retrofit technology that would not be studied but for this grant.
3. Engine configuration: engines and exhaust systems must be studied to facilitate the installation of the retrofit technology and its safe and successful operation on a construction site.

The vehicle selection will involve consultation with construction engineers and contracting agents from the City and CTDOT, and with vehicle/engine manufacturers.

DPF Selection Process:

A request for proposals (RFP) will be developed and issued. The Connecticut Department of Environmental Protection (CTDEP) will assist the City of New Haven in this effort and work to replicate the process developed for school bus retrofits in 2004. The selected vendor(s) will have demonstrated their ability to meet the following requirements:

4. Maximize reductions of PM, HC and CO, without the significant increase of any other pollutants of concern, notably NO_X, through installation of advanced emission control systems.
5. Provide sustainable support ensuring the effective operation of the emission control system for the full period of time the nonroad construction vehicles are in service in New Haven.
6. Provide full warranty coverage of the entire emission control system.
7. Ensure safe operational performance of the emission control system, the engine and the construction vehicle, and adhere to the safety precepts of the Connecticut Dept of Motor Vehicles, Commercial Vehicle Safety Division.

In addition to supplying the hardware, the vendor will be responsible for the following tasks: (1) complete systems engineering; (2) delivery and installation; (3) service technician and driver training; and (4) follow-up product and system support to sustain effective operation of the emission control system throughout the time that the construction vehicle is in operation in the City of New Haven. Towards this end, the prospective vendor should provide a work plan describing how they will successfully implement, at a minimum, the following specific tasks:

1. Interfacing with engine and vehicle manufacturer to ensure ECD compatibility (includes obtaining a *mandatory* warranty letter from the engine manufacturer).
2. Procuring the ECD, including storage for "just-in-time" delivery to the installation job site.
3. Engineering, fabricating and procuring all installation hardware.
4. Developing and procuring in-use operating software such as exhaust backpressure and temperature monitoring systems, if appropriate.
5. Installing the complete ECD system, including the ECD and the hardware and, if applicable, software kits.
6. Developing a maintenance plan to ensure long-term effective ECD operation.
7. Training fleet service technicians in installation, maintenance, and "in-use" troubleshooting and safety.
8. Training fleet drivers in proper operation, detection of operating anomalies, and proper safety procedures.
9. Documenting retrofit installation through accurate record keeping as well as providing instruction manuals to service technicians and school bus drivers.
10. Participating in sustainability activities – Project Partners will be developing and implementing outreach and education programs associated with this project. Prospective vendors are expected to participate in these endeavors and are encouraged to provide details regarding the extent and type of their participation.

The City of New Haven will convene a technology selection team to evaluate proposals received in response to the RFP. As part of the Cooperative Agreement, EPA Region 1 will be included. Other members of the technology selection team would likely include: New Haven (the City's procurement officer, and the contracted Project Manager, Representatives from the Mayor's Office, the City Plan Department), CTDOT, CTDEP, the Connecticut Construction Industries Association (CCIA) and the Connecticut Department of Motor Vehicles (CTDMV). The team will also include experts in the area of diesel emissions, construction equipment manufacture and environmental public policy, in particular Environment Northeast and potentially the Northeast States for Coordinated Air Use Management (NESCAUM). A communications strategy will be developed to ensure that the community is informed of decisions made by the technology selection team.

Evaluation Criteria For ECD Selection:

Proposal selection will be based upon a number of criteria, enumerated below. Because this is a demonstration project, it is acknowledged that product information may apply to on-road applications and include criteria that do not apply directly to nonroad construction vehicles. No single criterion receives more weighting than another, and proposals will be judged in their entirely in the context of whether they effectively meet the goals of the program, as outlined above. The criteria for evaluation of proposals will reference, at a minimum, the following:

1. Technical Management: Is the company's Project Team well defined and well resourced? Is the company's prior technical and management experience consistent with the needs and goals of this project? Is the project management approach clear and concise? Is the record keeping sufficiently robust for ongoing and future reference?
2. ECD Technical Merit and Feasibility: Does the selection of the ECD take into account the nonroad construction vehicle operating conditions? Is the technology simple to install and maintain? Is the technology robust, both in terms of emissions performance and structural integrity? Does the ECD engender safety concerns that a) make it unattractive as a candidate ECD, or b) are safety concerns adequately addressed in the project plan?
3. ECD Environmental Benefits: Are maximum reductions of diesel PM, HC and CO achieved? Is the approach for quantification of these reductions meritorious and robust? If some form of testing is elected for emission quantification, are the methods scientifically sound? Is ECD performance in on-road applications sustainable over time and well documented?
4. Project Support: Does the company have an established dealer support mechanism, including local agents for timely emergency response? Is the support mechanism robust, well resourced and adequately accounted for in the budget? Does the proposal provide references and historical background from prior projects, substantiating a satisfactory support track record?
5. Training: Is the training plan sufficiently comprehensive to ensure safe, effective maintenance by service personnel, and vehicle operation by drivers? Are associated training materials, such as texts, audiotapes and/or videotapes, of professional quality and easy to comprehend? Is the background of the instructors well matched to the product?
6. Budget: While budgetary considerations are always a factor in vendor selection, it is imperative that a technical vendor with the proper credentials and qualifications be contracted for this project. As such, the Selection Committee will not necessarily make the contract award to the lowest bidder. Rather, favorable consideration will be given to budgets that are clearly commensurate with the content of the work outlined in the proposal. Does the budget section clearly delineate costs for the itemized tasks? Is the cost-sharing component consistent with the goals and objectives of the project?

Timeline:

The project will be conducted in several phases, detailed in the table below.

Step	Action	Estimated date
1-Construction Project Identification	Identify project, project manager and construction contractor	Prior to application
2-Data Collection	Collect operational exhaust temperature and duty cycle data. Data log several construction vehicles. To be completed by project manager.	Within 4 months of funding availability
3-Project	Assemble Project management team consisting of EPA	

Step	Action	Estimated date
Management Team	representative, Project Manager and appropriate City officials, contractor, CTDOT, CTDEP, CCIA, ENE and other knowledgeable partners.	Within 4 months of funding availability
4- RFP Release	Release Request for Proposals to DPF providers. To be completed by City of New Haven and project manager with assistance from CTDEP, EPA, and ENE.	Within 6 months of funding availability.
5- ECD Identification and Selection	Identify and select ECD technologies. To be completed by a project management team and project manager.	Within 8 months of funding availability
6- ECD Engineering	Perform hardware engineering, design, and fabrication for the retrofits and on-vehicle malfunction warning lights as necessary: Installation of ECDs will be performed. If appropriate, backpressure monitors, pressure gauges, in-use data loggers may be installed. To be completed by contractor or manufacturer maintenance staff, ECD technology vendor, and project manager.	Within 10 months of funding availability
7- ECD Installation	Install the ECDs on target vehicles. Contractor staff will work with the project manager and the technology vendor to install, test, and maintain the DPF equipment.	Within 12 months of funding availability.
8- Long-Term Maintenance	The project manager and/or the ECD technology vendor will train the project Engineer and contractor's staff in the proper maintenance and routine repair of the ECD and retrofitted exhaust system.	During DPF Engineering and Installation - Step 6
9- Feasibility Demonstration and Evaluation	The Project Engineer, project manager and contractor's staff will make vehicle(s) available for evaluation by EPA, CTDOT, ENE, the manufacturers and their agents.	During project implementation and in the months following
10- Project Support	Conduct outreach and education to support community understanding of air pollution, diesel and particulate matter emissions and the retrofit project. To be conducted by the City of New Haven, CTDEP, ENE or other organization identified by project manager and EPA.	During project implementation and in the months following.

Meeting EPA Goals:

Virtually all of the systems verified by CARB for its highest level of emissions control, Level 3 at ≥ 85% reduction, include DPF technology. These are highly effective in reducing particulate emissions in on-road applications. Those that are VERT verified do not significantly increase NO_X emissions in the process. One product, which is being considered in school bus applications, provides a 25% decrease in NO_X emissions. DPF systems, shown to be the most beneficial and effective diesel emissions reduction technologies for on-road applications, should have the greatest potential for emissions reductions in nonroad construction equipment.

Because of the variety of configurations of engine and exhaust systems in diesel construction vehicles, the installation of each DPF system in each individual vehicle could be construed as an innovative or unique demonstration. As the VERT researchers stated, "…the suitability of the PFS [particulate filter system] for particular engine types or deployment duties with respect to regeneration conditions – basically unknown beforehand – cannot be deduced. Consequently the trap selection is the responsibility of the retrofitters, who must acquire the necessary expertise." This demonstration project will begin to give American retrofitters that necessary expertise.

The DPF system and engine configuration that provide the most straightforward or accessible installation are most likely to result in widespread adoption of that diesel reduction strategy. It is equally apparent, however, that commonly used vehicles, regardless of configuration/installation issues, can give retrofitters more experience to effect a similar widespread adoption. The same can be said for advanced diesel oxidation catalysts, or flow-through filters. While these should not require extensive pre-installation testing and custom engineering, they are new to the market and will therefore benefit from demonstration. One installation will not go far in establishing that retrofit experience, but a successful demonstration of the retrofitted technology will provide incentive for more retrofitters to approach and cross that threshold.

In addition to providing retrofit experience and expertise to one Connecticut contractor, this value of this demonstration will also be measured by the education it will provide to other contractors, vendors, technicians, government officials and community health advocates. If advanced ECDs are to proliferate economy-wide, these constituencies will be the drivers.

Expected Outcomes:

Several ECD retrofit technologies that are verified for on-road use in the United States, have already been verified and put to use on nonroad construction vehicles in Europe. Technologies selected from this group would have the best chance for success and would more quickly expand the ECD retrofit options available in the US. These have demonstrated capabilities to reduce particulate emissions from 50% to over 85% and continue to function reliably after 2000 hours of operation. By building on the Swiss experience, we should more rapidly have a technology suitable for widespread adoption in the US. The recently completed demonstration pilot at the PATH station site near the World Trade Center resulted in a complete DPF retrofit replacement kit that is a direct replacement for the original muffler. The kit has an associated part number and is thoroughly integrated into the CAT wheel loader's engineering specifications. This procedure ensures repeatability, a priority for this proposed demonstration.

Any reduction in particulate emissions in this $PM_{2.5}$ hot spot would be valuable. The PATH station (World Trade Center) pilot demonstrated a PM2.5 reduction of 97.5% from a wheel loader equipped with a diesel particulate filter. Other pollutants reduced included carbon monoxide (86.6%), hydrocarbons (97.4%), nitrogen oxides (19.7%), and carbon dioxide (5.1%). We would expect to see corresponding reductions in targeted

vehicles in New Haven In addition to the proposed project site at the new Cooperative Arts Magnet High School, the City of New Haven has a number of major demolition and construction projects planned in the downtown area over the next several years. Unless equipment emissions are adequately mitigated, particulate matter levels in the downtown area could rise. The successful demonstration of advanced ECD technology on construction vehicles in a local fleet would provide the City and state with incentive to expand the technology through municipal and CTDOT contract clauses in the future and increase the pollution reduction benefits exponentially.

Demonstration Value:

At this point in time, the DPF retrofit of any piece of nonroad diesel construction equipment is a custom operation for the retrofitter. And each retrofitted vehicle will have to be tested in a real construction environment to troubleshoot the system and ascertain the feasibility of the modification. Nothing in this field is common knowledge in the United States and it will take the retrofitting of a significant number of vehicles before the information gained from each installation is common knowledge. While information from the prior pilot projects at the Big Dig, the World trade Center Reconstruction, and from ongoing demonstrations in New Jersey, California and Europe is becoming more widely available, the task is easier, but the hands-on experience provided by this program, especially to fleet operators and state officials in New England, is invaluable.

The construction projects being considered for this demonstration, the ongoing Q-Bridge project and the demolition of the Coliseum, are high-profile projects in the center of New Haven, in a $PM_{2.5}$ nonattainment area, where community interest in environmental issues is great. A successful demonstration project in this environment will attract the kind of attention that can provide incentives to include retrofit clauses in other contracts, building a fleet of advanced ECD retrofitted construction equipment in the area.

Sustainability:

This will be the first DPF retrofit project conducted with nonroad diesel construction vehicles in Connecticut. The City of New Haven's project manager and the DPF supplier will provide comprehensive training to both the project engineer and the contractors in DPF operation and maintenance. New Haven and CTDOT's familiarity with DPFs and their installation will likely reassure other contracting agencies in the state of the feasibility of this type of project. A successful experience will serve as a model for other contractors wishing to implement retrofits on their own vehicles. As a side note, communities in the New Haven area have become rather competitive about air quality initiatives. The proposed project would further this constructive competition.

Through the partnership with the Connecticut Construction Industry Association, this project could be used as an opportunity for hands-on student training in ECD installation and maintenance. Training the next generation of equipment engineers in the installation of emission control devices would be a valuable way to ensure that this project would have lasting effects.

Finally, since this project would be located within the existing structure of the New Haven Diesel Reduction Strategy, existing stakeholder buy-in, momentum and policy support of this emission management system will benefit, and be benefited by, successful implementation of this proposed project.

Demonstration of Commitment:

New Haven's commitment to diesel emissions reductions is evident from its response to the available environmental and health data showing the high concentration and toxic effects of diesel exhaust. In February of 2004, the City launched a Diesel Reduction Strategy. Thirty-four community and state stakeholders attended an initial meeting at New Haven City Hall. Stakeholders (including City staff, the State of Connecticut, local health and environmental organizations, local businesses, elected officials, EPA Region 1, and more) outlined a work plan for achieving reductions in diesel exhaust in New Haven. The work plan includes promoting the early adoption of ULSD among local fleets and targeting on and non-road diesel engines for emission control retrofits. Several initiatives have been funded and are already underway, for instance:

a) The City of New Haven has been using ULSD in municipal fleet vehicles since August 2002,
b) The City has conducted outreach to other municipalities and Yale University, encouraging the early adoption of ULSD,
c) This summer, the retrofit of the New Haven school bus fleet (182 buses) will be complete,
d) The Clean Air Construction Initiative, implemented by CTDOT, CTDEP and other stakeholders, requires that equipment used in the I-95 construction project through New Haven will be retrofit with oxidation catalysts. As stated previously, these state agencies are exploring the feasibility of upgrading the contract specification to require advanced emissions control (beyond DOCs).

Other near-term priorities for which funding has not yet been secured:

e) Retrofit the public works refuse and recycle vehicles with emission control devices,
f) Clean fuels and emission control retrofits or alternatives to idling for marine and locomotive engines,
g) Retrofit transit buses with diesel particulate filters,
h) Require use of emission control devices on construction equipment used for projects with state or municipal funding.

Connecticut's national leadership in reducing diesel emissions is reflected in its Strategic Plan for Diesel Risk Reduction, which has received national recognition by EPA. (See Fact Sheet in Appendix A.) CTDEP has established effective partnerships in pursuing these efforts and will use this framework in supporting New Haven in this demonstration project. Connecticut's diesel reduction strategy outlines a multi-faceted approach to reducing diesel emissions from school buses, engine idling, off-road construction equipment, heavy diesel truck engines, and distributed generators.

Environment Northeast has successfully advocated for policies and programs to reduce health risk from diesel exhaust since 2002, (read about ENE's New England Diesel Initiative at www.env-ne.org/diesel). The thrust of this effort has been focused in Connecticut, where ENE coordinates policy analysis and advocacy on the issue as the lead organization of the Connecticut Clean Diesel Initiative. As a project partner, ENE commits to leveraging this demonstration by sharing results regionally through a case study write-up and outreach (in person and in written / web-based materials).

Reporting Requirements:

For the duration of each phase of the project that is funded by this agreement, the City of New Haven will provide to EPA written quarterly progress reports on the status of retrofit selection, engineering, installation, retrofit and truck operation, maintenance training, and education and outreach efforts. Progress reports will be submitted pursuant to the schedule established by EPA. The City will provide a final report on the results of the retrofit projects detailing technical and implementation issues. The report will include information on issues such as: matching verified technologies to different engine types, installation experience, retrofitted engine performance, operator acceptance of ECDs, maintenance, estimated emissions reductions, addressing vehicle operator concerns, and other elements important for the replication of retrofit projects in other municipalities.

Other Factors:

This year, the Connecticut General Assembly passed legislation directing the Department of Environmental Protection to develop a comprehensive diesel emission reduction strategy. Along with school buses and transit buses, state-funded construction equipment was named in the legislation as a "priority fleet." The CTDEP's strategy will outline a plan, to be phased in beginning July 2006, for maximizing emission reductions from this fleet. The proposed pilot will add to the body of information needed for the CTDEP to make informed decisions about the content of this plan.

Programmatic Capability:

The proposed work plan is modeled after the New Haven School Bus Retrofit Project. Over the last two years, the City has been working with the CTDEP and NESCAUM to provide emissions control devices for the New Haven school bus fleet. This project is a Supplemental Environmental Project (SEP) funded through an enforcement action taken in the New Haven area. Although CTDEP is the lead agency, the City of New Haven has played a principle role in planning and decision-making. Other local project partners included Environment Northeast, the New Haven Environmental Justice Network, and Connecticut Fund for the Environment. These groups are strong advocates of diesel emission control in Connecticut, having formed the Connecticut Clean Diesel Initiative to advocate for aggressive emissions control through state and local policy channels. Environment Northeast is a member of the proposed project team, and it is anticipated that the other advocacy organizations would remain partners.

The school bus project will retrofit all 182 of the City's full-sized buses. Total budget, including the contract for project management (NESCAUM) amounts to approximately $440 thousand. Installations of retrofit devices are currently underway. All 182 school buses will be retrofitting with Spiracle Crankcase filters and diesel oxidation catalysts manufactured by the Donaldson Company. This experience has served as a valuable model, one that will be extremely useful to the proposed nonroad construction vehicle retrofit project. The City will replicate successful aspects of the school bus experience and integrate lessons learned. This recent experience will enable the City to proceed in a time-efficient and cost-effective manner.

Other partners in this proposed project have demonstrated their commitment to reducing diesel through the Clean Construction Initiative. Through a partnership with the Connecticut Department of Transportation (CTDOT) and other stakeholders in Connecticut, the Clean Construction Initiative was launched in 2002 to retrofit the nonroad fleet working on the I-95 Corridor Improvement Project through New Haven with oxidation catalyst technology. (See description in Appendix A.) Under this initiative, approximately 100 retrofits have been completed through the Q-Bridge contract specification. The CTDOT is currently evaluating the feasibility upgrading the required level of emission control to reflect best available control technology as it evolves through the 10 year life of this project. It is anticipated that his model can be used for CTDOT or municipal contracts to require advanced ECD technology on vehicles used in construction projects in New Haven. The expertise of CTDOT, CTDEP and CCIA will be available as these agencies join in the partnership to develop this DPF retrofit demonstration program for nonroad construction vehicles.

Detailed Budget:

Personnel	Unidentified In-kind
Fringe Benefits	Unidentified In-kind
Contractual Costs	$30,000
Travel	NA
Equipment	$95,000
Supplies (fuel differential)	$15,000
Other	NA
Total Direct Costs	$140,000
Total Indirect Costs	NA
Total Cost	$140,000

Budget Narrative:

The City of New Haven will select a contracted project manager through a competitive procurement process, in compliance with procedures contained in 40 CFR Parts 30 or 31, as applicable, and state and local procurement requirements. The budget allocation ($30,000) for a contracted project manager reflects broad involvement on the part of the selected contractor, who would assume responsibility for interfacing on behalf of the City

with project partners, ECD vendors and equipment owners. Responsibilities would include procurement, including overseeing all necessary pre-bid temperature and duty-cycle testing. The Project Manager will be responsible for emissions testing and all reporting requirements, including the development of a detailed close-out report summarizing the project and relevant findings.

The bulk of funding requested ($95,000) will be dedicated to equipment costs. This budget includes ballpark cost estimates for six construction vehicles:

	Diesel Particulate filter	Flow-through filter (Advanced DOC)	Closed crankcase system
Number	5	1	6
Cost per device	$15,000	$10,000	$1,666.67
Total Cost	$75,000	$10,000	$10,000

Included in this line item are costs of supplying the hardware, and also the following tasks: (1) complete systems engineering; (2) delivery and installation; (3) service technician and driver training; and (4) follow-up product and system support to sustain effective operation of the emission control system throughout the time that the construction vehicle is in operation in the City of New Haven.

The remaining budget allocation ($15,000) would be dedicated to covering the incremental costs of ultra-low sulfur diesel (ULSD) for the subject fleet over that of regular non-road diesel.

This project includes expected in-kind contributions from a variety of stakeholders and organizations in the form of personnel participation, communications and outreach. These include, but may not be limited to, the City of New Haven, Giordono Construction, the Connecticut Department of Environmental Protection, Environment Northeast, the Connecticut Construction Industry Association, and the Connecticut Department of Transportation.